

WHAT IS CLAIMED IS:

1. An apparatus for generating quasi-complementary turbo codes (QCTC), comprising:

5 a turbo encoder, including at least one constituent encoder for receiving an information bit stream and generating a stream of information symbols and at least one stream of parity symbols according to a given code rate, each of the constituent encoders generating at least one stream of parity symbols, the streams of the parity symbols from one constituent encoder corresponding to the streams
10 of the parity symbols from another constituent encoder;

a channel interleaver for independently interleaving the stream of the information symbols and the streams of the parity symbols from the constituent encoders, sequentially arranging the independently interleaved symbols in the streams of the corresponding parity symbols from the constituent encoders, and
15 serially combining the stream of the independently interleaved information symbols and the streams of the sequentially arranged parity symbols; and

a QCTC selector for repeating a stream obtained by serially combining the stream of the information symbols and the streams of the parity symbols, and selecting at least one stream from the repeated streams according to the code
20 select information.

2. An apparatus for generating quasi-complementary turbo codes (QCTC), comprising:

a turbo encoder for generating information symbol streams and

associated parity symbol streams in pairs according to a predetermined code rate by receiving an information bit stream, and outputting the information symbol streams and the parity symbol streams according to the code rate;

a channel interleaver for independently interleaving the parity symbol
5 streams and the information symbol streams, provided from the turbo encoder, multiplexing the parity symbol streams generated in pairs, and then serially combining the information symbol streams with the parity symbol streams; and

a QCTC generator for generating a QCTC by repeating and puncturing an output of the channel interleaver according to the code rate.

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3. The apparatus as claimed in claim 2, wherein the channel interleaver comprises:

an information symbol interleaver for interleaving the information symbol streams;

15 a plurality of interleavers for interleaving the associated parity symbol streams;

at least one multiplexer for multiplexing the parity symbol streams in pairs; and

a serial combiner for serially combining an output of the information
20 symbol interleaver with an output of the multiplexer.

4. The apparatus as claimed in claim 3, wherein each of the interleavers punctures or prunes input symbols such that a puncturing pattern of symbols before interleaving has a uniform puncturing distance.

5. The apparatus as claimed in claim 2, wherein the turbo encoder comprises:

- a turbo encoding block for generating a turbo code according to the code rate; and
- a demultiplexer for demultiplexing an output of the turbo encoding block into information symbol streams and parity symbol streams.

6. An apparatus for receiving a quasi-complementary turbo code (QCTC) and decoding the QCTC, comprising:

- a QCTC depuncturer for depuncturing received symbols according to a code rate, and performing soft combining on received sub-codes by sequentially storing the depunctured symbols;
- a channel deinterleaver for separating an output of the depuncturer into an information symbol stream and at least one parity symbol stream, demultiplexing the parity symbol streams into parity symbol stream pairs, and then separately outputting the parity symbol streams and the information symbol stream; and
- a turbo decoder for multiplexing an output of the channel deinterleaver, decoding the multiplexed output according to the code rate, and outputting an information symbol stream.

7. The apparatus as claimed in claim 6, wherein the channel deinterleaver comprises:

a separator for separating an output of the QCTC depuncturer into an information symbol stream and at least one parity symbol stream;

at least one demultiplexer for demultiplexing the parity symbol streams output from the separator into parity symbol stream pairs; and

- 5 at least one deinterleaver for deinterleaving outputs of the demultiplexers and information symbol stream.

8. A method for generating quasi-complementary turbo codes (QCTC), comprising the steps of:

- 10 generating information symbol streams and associated parity symbol streams in pairs according to a predetermined code rate by receiving an information bit stream, and outputting the information symbol streams and the parity symbol streams according to the code rate;

- independently interleaving the parity symbol streams and the information
15 symbol streams, multiplexing the parity symbol streams generated in pairs, and serially combining the information symbol streams with the parity symbol streams; and

generating a QCTC by repeating the serially combined streams and puncturing the repeated streams according to the code rate.

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9. The method as claimed in claim 8, wherein a puncturing pattern of symbols before interleaving has a uniform puncturing distance.

10. An apparatus for receiving a quasi-complementary turbo code (QCTC) and decoding the QCTC, comprising:

a combiner for sequenc combining the received symbols;

a channel de-interleaver for separating the combined symbols into an
 5 information symbol stream and parity symbol streams, matching the separated
 respective parity symbol streams with at least one other parity symbol streams,
 demultiplexing the matched parity symbol streams into at least one parity symbol
 streams according to a given code rate, and independently de-interleaving and
 outputting the information symbol stream and the demultiplexed parity symbol
 10 streams; and

a quasi-complementary turbo code decoder for multiplexing the
 independently interleaved parity symbol streams and the information symbol
 stream, after decoding that according to a predetermined decode rate, outputting
 the information symbol stream.

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11. The apparatus as claimed in claim 10, wherein the channel deinterleaver comprises:

a symbol separator for separating and outputting the information symbol
 stream and the parity symbol streams from the combined symbols;

20 a demultiplexer for demultiplexing the parity symbol streams mating
 with the other parity symbol stream and separating the respective parity symbol
 streams; and

a de-interleaver for independently de-interleaving the demultiplexed
 parity symbol streams and the respective information symbol stream.

12. The apparatus as claimed in claim 10, wherein the quasi-complementary turbo code decoder comprises:

a multiplexer for multiplexing and outputting the independently de-
5 interleaved parity symbol streams and the information symbol stream; and

a turbo decoder for outputting the information symbol stream, after decoding output symbols of the multiplexer according to a predetermined decode rate.

10 13. The apparatus as claimed in claim 10, wherein the combiner comprises:

a circular buffer memory for storing the received symbols; and

a sequence/symbol combiner for selecting and outputting a predetermined number of symbols of symbols stored in the circular buffer
15 memory, according to a code rate from the starting position.

14. The apparatus as claimed in claim 13, wherein the starting position of the circular buffer memory is the symbol next to the last symbol of the finally transmitted symbols whenever each symbol stream is received.

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15. The apparatus as claimed in claim 13, wherein the sequence/symbol combiner is combined with the previous transmitted symbol and outputs to the channel de-interleaver if there is a retransmission symbol of the received symbol.

16. The apparatus as claimed in claim 15, wherein the combination is a soft combination.

17. The apparatus as claimed in claim 15, wherein the combination is a
5 hard combination.

18. A method for receiving quasi-complementary turbo code (QCTC) and decoding the QCTC, comprising the steps of:

- (a) sequence combining the received symbols;
- 10 (b) separating the combined symbols into an information symbol stream and parity symbol streams, matching the separated respective parity symbol streams with at least one other parity symbol streams, demultiplexing the matched parity symbol streams into at least one parity symbol streams according to a given code rate, and independently de-interleaving and outputting the
15 information symbol stream and the demultiplexed parity symbol streams; and
- (c) multiplexing the independently interleaved parity symbol streams and the information symbol stream, after decoding that according to a predetermined decode rate, outputting the information symbol stream.

20 19. The method as claimed in claim 18, wherein the step (b) comprises the steps of:

- (a) separating and outputting the information symbol stream and the parity symbol streams from the combined symbols;

(b) demultiplexing the parity symbol streams mating with the other parity symbol stream and separating the respective parity symbol streams; and

(c) independently de-interleaving the demultiplexed parity symbol streams and the respective information symbol stream.

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20. The method as claimed in claim 18, wherein the step (c) comprises the steps of:

(a) a multiplexer for multiplexing and outputting the independently de-interleaved parity symbol streams and the information symbol stream; and

10 (b) a turbo decoder for outputting the information symbol stream, after decoding output symbols of the multiplexer according to a predetermined decode rate.

21. The method as claimed in claim 18, wherein the step (a)
15 comprises the steps of:

circularly storing the received symbols; and

selecting and outputting a predetermined number of symbols of symbols circularly stored, according to a code rate from the starting position.

20 22. The method as claimed in claim 21, wherein in the step (a) the starting position of the circular buffer memory is the symbol next to the last symbol of the finally transmitted symbols whenever each symbol stream is received.

23. The method as claimed in claim 21, wherein in the step (b) the sequence/symbol combiner is combined with the previous transmitted symbol and outputs to the channel de-interleaver if there is a retransmission symbol of the received symbol.

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24. The method as claimed in claim 23, wherein the combination is a soft combination.

25. The method as claimed in claim 23, wherein the combination is a
10 hard combination.

26. The method as claimed in claim 18, wherein in the step (b) the information symbols and a plurality of parity symbol streams are de-interleaved respectively, independently by PBRO (Partial Bit Reversal Order) De-
15 interleaving method.

27. An apparatus for receiving a quasi-complementary turbo code (QCTC) and decoding the QCTC, comprising:

a combiner for sequence combining the received symbols;
20 a symbol separator (De-Concatenation or Separation) for separating and outputting the information symbol stream and the parity symbol streams from the combined symbols;

a demultiplexer for demultiplexing the parity symbol streams mating with the other parity symbol stream and separating the respective parity symbol

streams;

a de-interleaver for independently de-interleaving the demultiplexed parity symbol streams and the respective information symbol stream; and

a quasi-complementary turbo code decoder for multiplexing the
5 independently interleaved parity symbol streams and the information symbol stream, after decoding that according to a predetermined decode rate, outputting the information symbol stream.

28. The apparatus as claimed in claim 27, wherein the interleaver
10 interleaves the information symbol streams and a plurality of parity symbol streams, respectively and independently by PBRO (Partial Bit Reversal Order) De-interleaving method.

29. The apparatus as claimed in claim 27, wherein the combiner
15 comprises:

a circular buffer memory for storing the received symbols; and

a sequence/symbol combiner for selecting and outputting a predetermined number of symbols of symbols stored in the circular buffer memory, according to a code rate from the starting position.

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30. The apparatus as claimed in claim 29, wherein the starting position of the circular buffer memory is the symbol next to the last symbol of the finally transmitted symbols whenever each symbol stream is received.

31. The apparatus as claimed in claim 29, wherein the sequence/symbol combiner is combined with the previous transmitted symbol and outputs to the channel de-interleaver if there is a retransmission symbol of the received symbol.

5 32. The apparatus as claimed in claim 31, wherein the combination is a soft combination.

33. The apparatus as claimed in claim 31, wherein the combination is a hard combination.

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